

UNIVERSITI TEKNOLOGI MARA

**TREATMENT OF OILY PRODUCED
WATER (OPW) USING MIXTURE OF
COAGULANT AND SHRIMP SHELL**

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ABSTRACT

The large volume and complex composition of oily produced water (OPW) make its treatment not a simple matter. Coagulation is a common method to treat OPW. However, the health and cost issues regarding chemical coagulant had piqued interest in natural coagulant. In this study, the efficiency of the coagulant mixture consists of chitosan and alum to treat OPW is studied. The optimum pH value and the best ratio of chitosan and alum were determined using a standard jar test apparatus. It was found that the coagulant worked best in the acidic condition which was pH 2 and the optimum chitosan dosage was 0.6 g/L where the oil percentage removals were 69% and 64% respectively. The best ratio of coagulant mixture was at 6:4 of chitosan to alum. The oil percentage removal by a coagulant mixture at the optimum condition was 69%. Generally, the mixture of chitosan and alum had the ability to treat OPW hence can reduce the alum usage.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

Produced water (PW) is water or brine that is a byproduct during oil and gas extraction from underground reservoirs. The source of PW may include from within, or below the hydrocarbon zone of the reservoir. It also may be from the injected fluids or chemicals into the formation of production and recovery purpose. Other terms for PW is connate water or formation water. The greatest risk that PW proposed are their contaminants and their large volume.

PW has a complex composition due to its contact with reservoir for centuries. Their composition also varies depending on geological characteristic, location and composition of hydrocarbon. Usually it will contain contaminants such as oil (hydrocarbon), dissolved salts, dissolved gases like carbon dioxide and hydrogen sulfide, formation solids, metals, naturally occurring radioactive materials and treating chemicals (Iggunnu & Chen, 2014; Lee, Neff, & Deblois, 2011). Usually PW is treated to reduce oil content and salinity until a certain level before it can be disposed or re-injected into the formation.

PW is proved as the biggest waste during oil and gas production. Referring the research by Fakhru'l-Razi et al. (2009), the volume of global PW is approximately at 250 million barrels per day compared to production of hydrocarbon which is 80 million barrels per day. Based from the recent research, the global water to oil ratio (WOR) is 3:1 (Fakhru'l-Razi et al., 2009). As the volume of PW is triple than oil production adds to its complex composition, the cost of PW management is significant and become great concern.

The greatest concern is oil and grease (O&G) concentration in produced water. Normally upstream oily produced water (OPW) contains approximately 500 mg/L O&G and to satisfy the discharge oil concentration limit which is 30 mg/L, a polishing method to treat OPW is needed (Jiménez, Micó, Arnaldos, Medina, & Contreras, 2018). Coagulation is widely used for water treatment and alum as a coagulant is commonly used.